MARICOPA ASSOCIATION of GOVERNMENTS

MAG ITS Strategic Plan Update

Technical Memorandum #6B

- ITS Implementation Plan

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1. INTRODUCTION AND BACKGROUND

Technical Memorandum No. 6B summarizes the efforts of Task 10, ITS Implementation Plan, of the *MAG ITS Strategic Plan Update*. This memorandum presents recommended ITS projects to satisfy the needs of stakeholders identified in Technical Memorandum No. 3. These needs were matched to corresponding ITS User Services and Market Packages, presented in Technical Memorandum No. 4, as defined by the ITS National Architecture. The projects that are recommended in this technical memorandum correspond to the recommended Market Packages, and fit into the regional ITS architecture vision that was presented in Technical Memorandum No. 5. The ITS Implementation Plan includes the following:

- Links between the ITS Strategic Plan and Annual Work Program;
- Identify potential short-term projects (2002-2006), mid-term projects (2007-2011), and long-term projects (2012-2021) for inclusion in the MAG Transportation Improvement Program (TIP);
- Identification of regional ITS operations and management resource needs; and
- Discussion of the ITS project rating system.

The main purpose of the ITS Implementation Plan is to recommend ITS projects for possible inclusion in the MAG Regional Transportation Plan and TIP. These projects have been designed to satisfy the needs identified in the MAG region by transportation stakeholders and are considered to be regionally significant projects. The MAG TIP currently includes both regionally significant projects as well as projects designed to satisfy local needs. It is expected that this mix of both regionally and locally significant projects will continue, and that the MAG ITS Committee will be responsible for prioritizing the projects recommended in the ITS Implementation Plan along with locally significant projects to determine which projects should be funded in a specific year.

The ITS Implementation Plan is presented in the following sections:

- **Section 2: Existing TIP** – This section describes the existing ITS Projects in the MAG TIP and the link between the ITS Strategic Plan, TIP and Annual Work Program.
- **Section 3: Recommended ITS Projects for the MAG Region** – This section presents recommended ITS projects for consideration to include in the MAG TIP. Projects are identified for short-term, mid-term and long-term deployments and are designed to meet the transportation needs identified by stakeholders in the MAG region.
- **Section 4: Operations and Management Resource Needs –** This section identifies the resources that will be needed to operate and manage the projects recommended for deployment in **Section 3**.
- **Section 5: Project Prioritization** – This section describes the current and proposed changes to the MAG ITS project prioritization process. This process will be used to prioritize existing and proposed projects in the TIP.
- **Section 6: Recommendations** – This section summarizes the recommendations made throughout this technical memorandum.

2. EXISTING TIP

MAG currently produces a 20-year Regional Transportation Plan (formerly called the Long-Term Transportation Plan) and a five-year TIP that includes both regionally and locally significant projects. The TIP is developed on an annual basis and allows MAG to program funds for projects consistent with regional and local priorities. The MAG ITS Committee has the responsibility for prioritizing ITS projects that are submitted for inclusion and funding in the MAG TIP to determine which projects should be included. The funded projects are then included in MAG's Annual Work Program.

The current draft TIP includes projects for fiscal years 2001 through 2005. The total cost of the ITS projects in the draft TIP is $36,090,500, and includes locally and federally funded projects. In some cases, projects are included in the draft TIP without having an identified source of funding available. A funding source must be identified for these projects before they can be implemented.

In Arizona, all projects that receive federal funding must include a local match of a minimum of 5.3% of the total cost of the project. It is important that state and local agencies determine a source of funding to meet this match requirement in order to successfully implement a project through the TIP process.

While the TIP has traditionally used Congestion Mitigation and Air Quality (CMAQ) funds for ITS projects, additional sources must be sought. This is especially important as operations and management of ITS projects becomes more critical in the MAG region. Most ITS projects rely on operations and management in order to successfully perform their desired function. For example, a freeway management system can not successfully manage incidents without properly functioning equipment to identify accidents, adjust the metering rates at freeway entrances, and display information. Operators must also be properly trained to respond to incidents and a traffic operation center must be appropriately staffed. As the MAG region deploys increasingly advanced ITS infrastructure, funds must be identified for long-term operations and management of that infrastructure. It is anticipated that some of this funding may be available through the MAG TIP process.

Table 1 provides a description of the current ITS projects that are in the MAG Draft TIP for the years 2001 through 2005. The agencies that are responsible for implementing the projects as well as the agencies responsible for operations and management have been identified. Implementation includes the planning, design and construction of a project. Operations and management include the staffing, operations, management, and maintenance of all facilities and equipment involved in the project. Fiscal year describes the year in which funding for the project is to begin. The amount to be funded locally and through federal funds have also been identified. In some cases, the total cost does not equate to the sum of the local and federal cost, indicating that additional funding must still be identified.

TABLE 1 - MAG DRAFT TRANSPORTATION IMPROVEMENT PROGRAM ITS PROJECTS
FY 2001-2005

PROGRAM AREA/PROJECT	DESCRIPTION	IMPLEMENTING AGENCY	OPERATIONS AND MANAGEMENT AGENCY	FISCAL YEAR	FUND TYPE	LOCAL COST	FEDERAL COST	TOTAL COST
Freeway Management System								
Freeway Service Patrol	Freeway Service Patrol (FY 2001)	DPS/MAG	DPS	2001	CMAQ	$130,080	$520,320	$650,400
Freeway Service Patrol	Freeway Service Patrol (FY 2002)	DPS/MAG	DPS	2002	CMAQ	$130,080	$520,320	$650,400
Freeway Service Patrol	Freeway Service Patrol (FY 2003)	DPS/ADOT	DPS	2003	State	$250,000	$0	$250,000
Freeway Service Patrol	Freeway Service Patrol (FY 2004)	DPS/ADOT	DPS	2004	State	$250,000	$0	$250,000
Freeway Service Patrol	Freeway Service Patrol (FY 2005)	DPS/ADOT	DPS	2005	State	$250,000	$0	$250,000
Arterial Management Systems								
Chandler Traffic Operations Center Upgrade	Upgrade Chandler Traffic Operations Center	Chandler	Chandler	2001	CMAQ	$22,800	$377,200	$400,000
Chandler Citywide Traffic Control Upgrades	Citywide upgrades to traffic control	Chandler	Chandler	2001	Local	$400,000	$0	$400,000
Chandler Signal Intertie	Traffic signal intertie/upgrade on Chandler Blvd (McQueen Rd to Cooper Rd)	Chandler	Chandler	2001	Local	$40,000	$0	$40,000
Chandler CCTV	Install CCTV camera at Alma School Rd/Elliot Rd and Alma School Rd/Warner Rd	Chandler	Chandler	2003	Local	$100,000	$0	$100,000
Chandler CCTV	Install CCTV camera at Chandler Blvd/Arizona Ave and Chandler Blvd/Price Rd	Chandler	Chandler	2003	Local	$100,000	$0	$100,000
Gilbert ATMS	Install Advanced Traffic Management System (Phase II) on Baseline and Guadalupe Rds from Gilbert Rd to Power Rd, and Val Vista Dr from Baseline Rd to Warner Rd	Gilbert	Gilbert	2001	CMAQ	$22,800	$377,200	$400,000
Glendale Computerized Signal System (Phase I)	Construct Phase I of computerized signal system on 59th Ave from Camelback Rd to Beardsley Rd, include hardware and software to interface with Peoria and Phoenix signals	Glendale	Glendale	2001	CMAQ	$48,165	$796,835	$845,000
Glendale Computerized Signal System (Phase II)	Construct Phase II of computerized signal system on Bell Rd from 51st Ave to 83rd Ave	Glendale	Glendale	2001	CMAQ	$50,000	$745,000	$795,000
Glendale Computerized Signal System (Phase III)	Construct Phase III of computerized signal system on Glendale Ave from 43rd Ave to 99th Ave, integrate with Peoria and Phoenix	Glendale	Glendale	2001	CMAQ	$27,000	$441,000	$468,000
Glendale Traffic Management Center	Design, construct and operate Glendale Traffic Management Center	Glendale	Glendale	2001	CMAQ	$55,119	$911,881	$967,000
MCDOT Traffic/Air Quality Monitoring	Perform realtime traffic/air quality monitoring to develop correlation between air quality and traffic control strategies	MCDOT	MCDOT	2001	Local	$550,000	$0	$550,000
MCDOT Regional Traveler Information System	Establish Regional Traveler Information System (travel and diversion routing to alleviate congestion)	MCDOT	MCDOT	2001	Local	$600,000	$0	$600,000
MCDOT Regionwide Traffic Signal Equipment Upgrades	Upgrade of regionwide traffic signal equipment, interconnection and timing to improve traffic flow	MCDOT	MCDOT	2001	Local	$2,500,000	$0	$2,500,000
AZTech SMART Corridor Program (Phase II)	Install AZTech SMART Corridor Program (Phase II)	AZTech/MCDOT	MCDOT	2001	CMAQ	$68,400	$1,131,600	$1,200,000
AZTech CCTV Program (Phase II)	Install AZTech CCTV Program (Phase II)	AZTech/MCDOT	MCDOT	2001	CMAQ	$100,000	$400,000	$500,000
AZTech VMS (Phase III)	Install AZTech VMS (Phase III - Note that Phase III VMS will be installed on Phase II SMART Corridors)	AZTech/MCDOT	MCDOT	2002	CMAQ	$100,000	$200,000	$300,000
MCDOT Bell Road	Install real-time traffic coordination and messaging system on Bell Rd	MCDOT	MCDOT	2004	CMAQ	$75,000	$775,000	$850,000
Mesa Traffic Operations Center	Upgrade and expand Mesa Traffic Operations Center	Mesa	Mesa	2001	CMAQ	$200,000	$500,000	$700,000

TABLE 1 - MAG DRAFT TRANSPORTATION IMPROVEMENT PROGRAM ITS PROJECTS
FY 2001-2005

PROGRAM AREA/PROJECT	DESCRIPTION	IMPLEMENTING AGENCY	OPERATIONS AND MANAGEMENT AGENCY	FISCAL YEAR	FUND TYPE	LOCAL COST	FEDERAL COST	TOTAL COST
Mesa Traffic Control Signal System	Install traffic control signal system (instrumentation and communications) on Stapley Dr from University Dr to McKellips Blvd	Mesa	Mesa	2001	CMAQ	$20,520	$339,480	$360,000
Mesa SMART Corridor	Install SMART corridor traffic control system on McKellips Rd from Gilbert Rd to Power Rd	Mesa	Mesa	2003	CMAQ	$250,000	$1,550,000	$1,800,000
Mesa Real-Time Adaptive Signal System	Install real-time adaptive signal system on Country Club Dr from 8th Ave to Baseline Rd	Mesa	Mesa	2004	CMAQ	$600,000	$1,100,000	$1,700,000
Peoria Citywide Traffic Signal Interconnect System (Phase III)	Design and construct citywide traffic signal interconnect system	Peoria	Peoria	2002	CMAQ	$57,000	$943,000	$1,000,000
Peoria Citywide Interconnect	Interconnect citywide traffic signal system	Peoria	Peoria	2004	CMAQ	$57,000	$943,000	$1,000,000
Scottsdale Fiber Optic and CCTV	Install fiber optic hardware and CCTV cameras and connect to AZTech system	Scottsdale	Scottsdale	2001	CMAQ	$200,000	$780,000	$980,000
Scottsdale SMART Corridor Traffic Control System	Install SMART corridor traffic control system on Scottsdale Rd from Pima Fwy to Indian School Rd	Scottsdale	Scottsdale	2005	CMAQ	$1,980,000	$2,200,000	$4,180,000
Tempe Traffic Signal Controller Cabinet Upgrade	Traffic signal controller cabinet upgrade at various locations	Tempe	Tempe	2002	Local	$17,500	$500,000	$517,500
Tempe Traffic Signal Controller Cabinet Upgrade	Traffic signal controller cabinet upgrade at various locations	Tempe	Tempe	2003	Local	$17,500	$500,000	$517,500
Tempe Traffic Signals	Install new/upgrade modular traffic signals at various locations	Tempe	Tempe	2004	Local	$320,000	$0	$320,000
Incident/Emergency/Event Management Systems								
MCDOT Parking and Traffic Management System (PIR)	Parking and traffic management system utilizing VMS and monitoring systems	MCDOT	MCDOT	2001	Local	$1,600,000	$0	$1,600,000
Phoenix Downtown Traffic Management System (Phase I)	Construct Phoenix Downtown Traffic Management System (Phase I)	Phoenix	Phoenix	2001	CMAQ	$90,000	$1,476,000	$1,566,000
Phoenix Downtown Traffic Management System (Phase II)	Construct Phoenix Downtown Traffic Management System (Phase II)	Phoenix	Phoenix	2002	CMAQ	$57,000	$943,000	$1,000,000
Planning and Outreach Support								
Chandler ITS Planning Study	Perform local ITS planning study	Chandler	Chandler	2004	Local	$80,000	$0	$80,000
Telecommunications Infrastructure								
Chandler Fiber Optic Line	Install fiber optic communications line on Arizona Ave from Elliott Rd to Chandler Blvd	Chandler	Chandler	2003	Local	$200,000	$0	$200,000
Chandler Fiber Optic Line	Install fiber optic communications line on Arizona Ave from Elliott Rd to Chandler Blvd (Phase II)	Chandler	Chandler	2003	Local	$250,000	$0	$250,000
Chandler Fiber Optic Line	Install fiber optic communications line on Arizona Ave from Chandler Blvd to Riggs Rd	Chandler	Chandler	2003	Local	$400,000	$0	$400,000
TOTAL TIP PROJECTS						**$12,265,964**	**$18,970,836**	**$31,236,800**

3. RECOMMENDED ITS PROJECTS FOR THE MAG REGION

3.1 Stakeholder Needs in the MAG Region

In Technical Memorandum No. 3 of the *MAG ITS Strategic Plan Update*, the transportation needs of the stakeholders in the MAG region were identified. Needs which could not be satisfied through the ITS projects and needs which ranked very low were eliminated from consideration in the *MAG ITS Strategic Plan Update*. A list of the priority needs for the MAG region, along with the score that they received from stakeholders in the MAG region, is provided in **Table 2**.

Table 2 – Stakeholder Needs

ID#	Stakeholder Need	Score
1	Need to integrate signal systems with freeway management system	91
2	Need improved incident clearance at freeway interchanges	68
4	Need to enhance regional signal coordination/improve progression	67
5	Need to reduce incident clearance time	64
6	Need to improve accuracy and timeliness of traffic information to public	60
7	Need to increase use of VMS for more types of information	47
8	Need to improve incident detection and notification to motorists	47
10	Need to increase inter- and intra-agency coordination	38
11	Need real-time transit schedule information	30
12	Need more accurate information about road construction/closures and alternate routes	29
13	Need bus priority at traffic signals	29
15	Need to develop and facilitate ITS education and marketing efforts to public	28
16	Need enhanced traffic management capabilities for special events	27
17	Need to increase use of computerized traffic signals	26
18	Need to improve real-time communication between TMCs and CVOs	25
19	Need to increase use of HAR	23
20	Need in-vehicle traffic information	22
21	Need more advanced warning at RR/street crossings	21
23	Need to integrate transit information with arterial and freeway management systems	21
24	Agencies need more traffic data to plan infrastructure improvements	20
25	Need freeway call boxes	20
26	Need AVL for transit	19
32	PSAPs need access to real-time traffic information	12
49	Need enhanced information at transit centers	5
52	Need to increase use of detector data/travel time data	3

Note: Missing ID numbers indicate those needs which could not be satisfied through ITS projects or needs which were not ranked high enough by stakeholders for consideration in the ITS Strategic Plan.

3.2 Recommended ITS Projects for the MAG Region

The stakeholder needs identified in **Table 2** were used to develop ITS user services and market packages for the MAG region, which were presented in Technical Memorandum No. 4. Based on the user services and market packages, a vision of the MAG regional architecture was then developed and was provided in Technical Memorandum No. 5. It is critical that projects identified in the MAG region be consistent with the MAG regional architecture, but also critical that the projects address the stakeholder needs.

A series of recommended projects have been developed for consideration for implementation in the MAG TIP. These projects do not include projects in the current TIP. They were developed based on stakeholders needs and are not matched against available funding. Projects have been developed for the following timeframes:

- Short-term (2002-2006), presented in **Table 3**;
- Mid-term (2007-2011), presented in **Table 4**; and
- Long-term (2012-2021), presented in **Table 5**.

The projects presented in **Tables 3, 4 and 5** represent regionally significant projects. It is anticipated that a number of locally significant projects will be developed by local agencies and will also need to be considered for inclusion in the TIP. It will be the responsibility of the MAG ITS Committee to determine which projects are most important and should receive funding – the prioritization of the funded projects is determined by the year that is programmed.. The projects recommended in the Short-term, Mid-term and Long-term ITS Implementation Plan are not intended to supercede projects in the existing MAG TIP, however projects in the ITS Implementation Plan are encouraged to be implemented in order to meet the needs of the regional stakeholders.

Several of the projects identified for short-term, mid-term and long-term implementation are in excess of $1 million. It is anticipated that these projects will actually be implemented in phases.

Each project identified includes the following categories:

Program Area/Project – The program area, such as Traveler Information System or Arterial Management System, to which the project is most closely identified with, as well as the name of the potential project.

Description – Brief description of the project.

Implementing Agency – The agency responsible for the planning, design and construction of a project.

Managing and Operating Agency – The agency responsible for the staffing, operations, management, and maintenance of all facilities and equipment involved in the project

Opinion of Probable Cost – An estimate of the probable cost of the project. The cost may vary significantly depending on the level of deployment that the implementing agency desires. For example, the project to implement arterial speed maps may target a limited number of arterials and not require a high level of accuracy, in which case the cost of the project could decrease. If the number of arterials identified increases and a robust system with a very high level of accuracy is desired, the cost could increase.

Associated User Needs (ID Number) – The identification number (see **Table 2**) of the stakeholder needs that this project may satisfy.

TABLE 3 - MAG ITS STRATEGIC PLAN - RECOMMENDED PROJECTS
SHORT-TERM PROJECTS (2002-2006)

PROGRAM AREA/PROJECT	DESCRIPTION	IMPLEMENTING AGENCY	MANAGING AND OPERATING AGENCY	OPINION OF PROBABLE COST	ASSOCIATED USER NEEDS (ID NUMBER)
Traveler Information Systems					
Integration of a Regional ATIS/ATMS System	Integrate ADOT FMS/AZTech/HCRS servers (and possibly replace TRW system) at ADOT TOC to provide integrated traveler information/traffic management system	ADOT/MCDOT	ADOT/MCDOT	$2,500,000	6,23
AZTech Work Stations (15)	Add AZTech Work Stations to up to 15 new ITS cities/agencies	AZTech/MCDOT	Local Agencies	$150,000	6,10,32
Traveler Information Systems Upgrade	Upgrade existing traveler information systems (HCRS/411-ROAD/RCRS) to accommodate new technologies, such as wireless internet and in-vehicle applications	ADOT/Local Agencies/Private Sector	ADOT/Local Agencies/Private Sector	$1,000,000	6,8,11,20
Arterial Speed Maps	Develop maps to display speeds on arterial streets	MAG/Local Agencies	Local Agencies	$500,000	6,52
SUBTOTAL				**$4,150,000**	
Freeway Management System					
FMS Phase 8	Install FMS components on US 60 (Dobson Rd to Power Rd)	ADOT	ADOT	$14,070,000	2,5,6,8,16
FMS Phase 3B	Install FMS components on I-17 (Perioa Ave to Happy Valley Rd)	ADOT	ADOT	$10,350,000	2,5,6,8,16
FMS Phase 6B	Install FMS components on Loop 202N (Loop 101 to SR 87) Install FMS components on Loop 101 (Loop 202 to 90th St)	ADOT	ADOT	$16,560,000	2,5,6,8,16
FMS Phase 9A	Install FMS components on Loop 101S (Guadalupe Rd to Loop 202)	ADOT	ADOT	$6,000,000	2,5,6,8,16
FMS Phase 12B	Install FMS components on Loop 101 (I-17 to Scottsdale Rd) Install FMS components on SR51 (Bell Rd to Loop 101)	ADOT	ADOT	$14,600,000	2,5,6,8,16
Freeway Service Patrol/ATMS Link	Develop and implement links to connect the freeway service patrol with the ADOT TOC traffic management system	ADOT/DPS	ADOT/DPS	$500,000	2,5,8,10,12
ADOT TOC Upgrades	Upgrade ADOT TOC software and hardware	ADOT	ADOT	$1,000,000	2,5,6,8,16
SUBTOTAL				**$63,080,000**	
Arterial Management Systems					
AZTech SMART Corridor Program (Phase III)	Install AZTech SMART Corridor Program (Phase III)	AZTech/MCDOT	Local Agencies	$3,000,000	2,5,10,12
Roadway Condition Reporting System	Add RCRS to large cities w/o existing or planned RCRS capability (Goodyear, Peoria, MCDOT)	AZTech/MCDOT	Local Agencies	$100,000	6,8,10,12,32
Traffic Management Center	Implement TMC in Gilbert	Gilbert	Gilbert	$250,000	4,17
Signal Timing Improvements to Interjurisdictional Signals and SMART Corridors	Improve signal coordination at interjurisdictional borders and along SMART Corridors	MAG/Local Agencies	Local Agencies	$500,000	4
Railroad Crossing Pilot Program	Railroad crossing pilot program to demonstrate effectiveness of advanced railroad crossing warning devices	MAG/Local Agencies/ Railrds	MAG/Local Agencies/ Railrds	$250,000	21
SUBTOTAL				**$4,100,000**	

TABLE 3 - MAG ITS STRATEGIC PLAN - RECOMMENDED PROJECTS
SHORT-TERM PROJECTS (2002-2006)

PROGRAM AREA/PROJECT	DESCRIPTION	IMPLEMENTING AGENCY	MANAGING AND OPERATING AGENCY	OPINION OF PROBABLE COST	ASSOCIATED USER NEEDS (ID NUMBER)
Transit Management System					
Scheduling System	Implement Scheduling System with dispatch module for fixed route fleet.	Valley Metro/Local Agencies	Valley Metro/Local Agencies	$750,000	6
Trip Planning System	Implement Trip Planning System with option for Internet connection for trip planning and interactive voice recognition	Valley Metro/Local Agencies	Valley Metro/Local Agencies	$750,000	11
Regional Validating Farebox	Implement system for regional validating farebox	Valley Metro/Local Agencies	Valley Metro/Local Agencies	$10,000,000	24
Vehicle Management System	Implement Vehicle Management System which will include new radios, AVL/GPS equipment, silent alarms and computer aided dispatch	Valley Metro/Local Agencies	Valley Metro/Local Agencies	$12,000,000	6,11,26,49
Bus Rapid Transit and Light Rail Signal Priority	Implement signal prioritization along bus rapid transit and light rail routes	Valley Metro/Local Agencies	Valley Metro/Local Agencies	$5,000,000	13
Audio/Visual Announcements	Implement system to provide on-board audio/visual announcements to transit passengers	Valley Metro/Local Agencies	Valley Metro/Local Agencies	$3,000,000	6
Passenger Counting	Implement automated passenger counting system	Valley Metro/Local Agencies	Valley Metro/Local Agencies	$2,500,000	24
Real Time Transit Arrival Time	Provide real time information on transit arrival at light rail and bus stops	Valley Metro/Local Agencies	Valley Metro/Local Agencies	$500,000	6,11,49
Transit Routing Based on Incident Information	Implement fixed route/dial-a-ride bus routing based on incident information	Valley Metro/Local Agencies	Valley Metro/Local Agencies	$500,000	23
SUBTOTAL				**$35,000,000**	
Incident/Emergency/Event Management Systems					
Regional Incident Management Plans	Development and pilot implementation of regional incident management strategies to integrate freeway and arterial streets	MAG	ADOT/Local Agencies	$500,000	1,2,5,10
Regional Incident Management Coalition	Establish a regional incident management coalition, provide training and support	MAG	MAG	$300,000	2,5,10
Integrate Traffic/Dispatch System	Integrate traffic information on FMS/local streets with PSAP CAD dispatching	ADOT/Phoenix Fire	ADOT/Phoenix Fire	$3,000,000	32
Phoenix International Raceway Special Event Traffic Management System	Implement special event traffic management system at Phoenix International Raceway	MCDOT	MCDOT	$4,000,000	16
SUBTOTAL				**$7,800,000**	
Commercial Vehicle Operations					
CANAMEX Corridor ITS Study	Study designated CANAMEX Corridor to determine feasibility of implementing ITS technologies	ADOT/MAG	ADOT	$150,000	18
				$150,000	

TABLE 3 - MAG ITS STRATEGIC PLAN - RECOMMENDED PROJECTS
SHORT-TERM PROJECTS (2002-2006)

PROGRAM AREA/PROJECT	DESCRIPTION	IMPLEMENTING AGENCY	MANAGING AND OPERATING AGENCY	OPINION OF PROBABLE COST	ASSOCIATED USER NEEDS (ID NUMBER)
Planning and Outreach Support					
Local ITS Deployment Plans	Individual ITS deployment plans for Local Agencies	Local Agencies	Local Agencies	$1,000,000	10
Regional Concept of Operations	Develop regional concept of operations plan	MAG	ADOT/Local Agencies	$250,000	1,4,7,10,52
ITS Training	Implement training program to enhance professional development	MAG	MAG	$250,000	15
ITS Outreach	Develop program to inform public of ITS technologies and how they can use information to improve travel	MAG/ITS Arizona	MAG/ITS Arizona	$250,000	15
ITS Project Evaluation	Approximately 5% of total budget for ITS projects to be used for evaluating projects (Evaluation budget to be spread out over 5 years)	MAG	MAG	$1,500,000	15
ITS Pedestrian/Bicycle Projects	Study and plan for ITS pedestrian and bicycle projects	MAG/Local Agencies	Local Agencies	$250,000	15, 16, 52
SUBTOTAL				**$3,500,000**	
Telecommunications Infrastructure (Projects Developed in Technical Memorandum No. 7, ITS Telecommunications Plan					
Infrastructure Improvements to Support Regional WAN	Evaluate existing infrastructure, develop a plan for interconnecting spare fiber segments, and perform the fiber connections needed for each of the WAN links identified	ADOT	ADOT	$75,000	10
SONET Configuration for Regional WAN	Configure SONET equipment to support the various WAN links.	ADOT	ADOT	$125,000	10
Conduit/Fiber Installation on US 60	Install fiber cable within the conduit infrastructure along US 60 beyond Dobson Road to Gilbert Road (fiber design and installation)	ADOT	ADOT	$125,000	10
Fiber Installation on SR-101	Install fiber optic cable within programmed conduit infrastructure along SR-101 between Chandler Boulevard and Guadalupe RD (fiber installation).	ADOT	ADOT	$100,000	10
Fiber Installation on Loop 101	Install new fiber within existing conduit infrastructure along Loop 101 between Glendale Ave and I-10.	ADOT	ADOT	$137,500	10
Conduit/Fiber Installation on I-10	Design and install new conduit and fiber infrastructure along I-10 between Loop 101 and 83rd Ave.	ADOT	ADOT	$370,000	10
ADOT Video Switching Upgrades	Upgrade the existing video switching system.	ADOT	ADOT	$250,000	10
WAN Hub Equipment Upgrade	Upgrade WAN hub equipment (ATM/Ethernet switches)	ADOT	ADOT	$100,000	10
DPS WAN Connection	Provide WAN connection on the regional fiber network that supports DPS (evaluation and installation)	DPS	DPS	$30,000	10
DPS/ADOT Fiber Connection	Install new fiber connection between the DPS and I-17.	ADOT/DPS	ADOT/DPS	$400,000	10
ADOT/Chandler Connection	Design and install the fiber connections between ADOT and Chandler infrastructure	Chandler	Chandler	$50,000	10
Chandler TMC/PD WAN Connection	Provide WAN connection on the regional fiber network that supports both Chandler TMC and PD (evaluation and installation)	Chandler	Chandler	$170,000	10
Peoria/Glendale Connection	Design and install new conduit and fiber infrastructure within Glendale city limits for the fiber path between Peoria TMC and Glendale TMC	Glendale	Glendale	$277,500	10

TABLE 3 - MAG ITS STRATEGIC PLAN - RECOMMENDED PROJECTS
SHORT-TERM PROJECTS (2002-2006)

PROGRAM AREA/PROJECT	DESCRIPTION	IMPLEMENTING AGENCY	MANAGING AND OPERATING AGENCY	OPINION OF PROBABLE COST	ASSOCIATED USER NEEDS (ID NUMBER)
Glendale Conduit/Fiber Connection	Design and install new fiber and conduit infrastructure along Glendale Ave between 59th Ave and 75th Ave.	Glendale	Glendale	$370,000	10
Glendale Fiber Connection	Design and install new fiber within existing City of Glendale conduit infrastructure along Glendale Ave between 75th Avenue and Loop 101	Glendale	Glendale	$75,000	10
Peoria TMC/PD and Glendale TMC/PD WAN Connection	Provide WAN connection on the regional fiber network that supports Peoria TMC and PD, the Glendale TMC and PD (evaluation and installation)	Glendale	Glendale	$150,000	10
Gilbert Fiber Connection	Design and install new conduit and fiber infrastructure within Gilbert town limits for the fiber path along Gilbert Road between Baseline Road and the Gilbert TMC	Gilbert	Gilbert	$647,500	10
Gilbert/PD WAN Connection	Provide WAN connection on the regional fiber network that supports Gilbert TMC and PD	Gilbert	Gilbert	$170,000	10
Maricopa County Sheriff's Office Fiber Connection	Design and install new conduit and fiber infrastructure within Phoenix City Limits to connect to existing infrastructure for the fiber path between MCSO and ADOT TOC.	Maricopa Co Sheriff's Office	Maricopa Co Sheriff's Office	$92,500	10
Maricopa County Sheriff's Office WAN Connection	Provide WAN connection on the regional fiber network that supports MCSO (evaluation and installation)	Maricopa Co Sheriff's Office	Maricopa Co Sheriff's Office	$30,000	10
Mesa Fiber Connection	Design and install new conduit and fiber infrastructure within Mesa city limits for the fiber path along Gilbert Road between US 60 and Baseline Road	Mesa	Mesa	$185,000	10
Mesa Fiber Connection	Design and install fiber connections within programmed fiber infrastructure for fiber optic path between the Mesa TMC and U.S. 60.	Mesa	Mesa	$50,000	10
Mesa TMC	Provide WAN connection on the regional fiber network that supports Mesa TMC, Fire, Transit and PD	Mesa	Mesa	$120,000	10
Paradise Valley Fiber Connection (PV Segment)	Design and install new conduit and fiber infrastructure within Paradise Valley town limits for the fiber path between Paradise Valley PD and Scottsdale TMC	Paradise Valley	Paradise Valley	$92,500	10
Paradise Valley Fiber Connection (Phoenix Segment)	Design and install new conduit and fiber infrastructure within Phoenix city limits for the fiber path between Paradise Valley PD and Scottsdale TMC	Paradise Valley	Paradise Valley	$92,500	10
Paradise Valley Fiber Connection (Scottsdale Segment)	Design and install new conduit and fiber infrastructure within Scottsdale city limits for the fiber path between Paradise Valley PD and Scottsdale TMC	Paradise Valley	Paradise Valley	$92,500	10
Paradise Valley PD WAN Connection	Provide WAN connection on the regional fiber network that supports Paradise Valley PD (evaluation and installation)	Paradise Valley	Paradise Valley	$30,000	10
Peoria Fiber Connection	Design and install new conduit and fiber infrastructure within Peoria city limits for the fiber path between Peoria TMC and Glendale TMC	Peoria	Peoria	$277,500	10

TABLE 3 - MAG ITS STRATEGIC PLAN - RECOMMENDED PROJECTS
SHORT-TERM PROJECTS (2002-2006)

PROGRAM AREA/PROJECT	DESCRIPTION	IMPLEMENTING AGENCY	MANAGING AND OPERATING AGENCY	OPINION OF PROBABLE COST	ASSOCIATED USER NEEDS (ID NUMBER)
Peoria TMC/PD WAN Connection	Provide WAN connection on the regional fiber network that supports Peoria TMC and Police Department (evaluation and installation)	Peoria	Peoria	$60,000	10
Phoenix/Fire Fiber Connection	Design and install new fiber within the programmed conduit infrastructure along 12th St. and Washington between Phoenix Fire and the existing ADOT conduit/fiber infrastructure at SR 51.	Phoenix Fire	Phoenix Fire	$50,000	10
Phoenix Fire WAN Connection	Provide WAN connection on the regional fiber network that supports Phoenix Fire (evaluation and installation)	Phoenix Fire	Phoenix Fire	$30,000	10
Phoenix Transit Fiber Connection	Design and install new conduit and fiber infrastructure between Phoenix Transit and the ADOT TOC	Phoenix Transit	Phoenix Transit	$92,500	10
Phoenix Transit WAN Connection	Provide WAN connection on the regional fiber network that supports Phoenix Transit (evaluation and installation)	Phoenix Transit	Phoenix Transit	$30,000	10
Scottsdale Rural Metro Fiber	Design and install new conduit and fiber infrastructure between the Scottsdale existing infrastructure and the Rural Metro building	Rural Metro	Rural Metro	$92,500	10
Rural Metro WAN Connection	Provide WAN connection on the regional fiber network that supports Rural Metro (evaluation and installation)	Rural Metro	Rural Metro	$30,000	10
Scottsdale Fiber Connection	Program the installation of 12 single-mode fibers into existing conduit infrastructure along SR-101 between Indian School Road and SR-202 and provide fiber connection within existing fiber infrastructures(fiber installation).	Scottsdale	Scottsdale	$112,500	10
Scottsdale TMC/Transit/PD/Rural Metro WAN	Provide WAN connection on the regional fiber network that supports Scottsdale TMC, Transit, PDs (1 and 2) and Rural Metro (evaluation and installation)	Scottsdale	Scottsdale	$150,000	10
Tempe Fiber Connection	Design and install the fiber connections between the ADOT and Tempe infrastructure	Tempe	Tempe	$30,000	10
Tempe TMC/Transit/PD Connection	Provide WAN connection on the regional fiber network that supports Tempe TMC, Transit, and PD (evaluation and installation)	Tempe	Tempe	$90,000	10
SUBTOTAL				**$5,452,500**	
TOTAL ITS IMPLEMENTATION PLAN				**$123,232,500**	
TOTAL FMS				**$61,580,000**	
TOTAL TRANSIT				**$35,000,000**	

TABLE 4 - MAG ITS STRATEGIC PLAN - RECOMMENDED PROJECTS
MID-TERM PROJECTS (2007-2011)

PROGRAM AREA/PROJECT	DESCRIPTION	IMPLEMENTING AGENCY	MANAGING AND OPERATING AGENCY	OPINION OF PROBABLE COST	ASSOCIATED USER NEEDS (ID NUMBER)
Traveler Information Systems					
Regional ATIS	Implement regional advanced traveler information projects	MAG/Local Agencies	MAG/Local Agencies	$1,000,000	6
AZTech Work Stations	Add AZTech work stations to new ITS cities	AZTech/MCDOT	Local Agencies	$100,000	6,10,32
HAR Pilot Program	HAR pilot program to demonstrate HAR effectiveness	ADOT/MCDOT	ADOT/MCDOT	$250,000	19
SUBTOTAL				**$1,350,000**	
Freeway Management System					
FMS Phase 12A	Install FMS components on Loop 101 (90th St to Scottsdale Rd)	ADOT	ADOT	$9,200,000	2,5,6,8,16
FMS Phase 10	Install FMS components on Loop 101 (Grand Avenue to I-17)	ADOT	ADOT	$16,700,000	2,5,6,8,16
FMS Phase 7C	Install FMS components on I-10 (Chandler Blvd to Queen Creek Rd)	ADOT	ADOT	$5,200,000	2,5,6,8,16
FMS Phase 11	Install FMS components on I-10 (99th Ave to 83rd Ave) Install FMS components on Loop 101 (I-10 to Grand Ave)	ADOT	ADOT	$13,550,000	2,5,6,8,16
ADOT TOC Upgrades	Upgrade ADOT TOC software and hardware	ADOT	ADOT	$1,000,000	6,8
Travel Time Display on FMS	Develop software to allow VMS display of travel times to known points in the Valley	ADOT	ADOT	$400,000	7
SUBTOTAL				**$46,050,000**	
Arterial Management Systems					
SMART Corridor Freeway Alternate Routes Expansion/Addition	Expand existing SMART corridors and add new corridors as needed with freeway growth to assist in diversion of traffic during incidents (Approximately 10 Routes)	AZTech/MCDOT	Local Agencies	$3,000,000	1,2,5,10,12
SMART Corridor Expansion/Addition	Expand existing corridors and add new corridors to provide additional coverage for high growth areas (Approximately 15 expanded or new routes)	AZTech/MCDOT	Local Agencies	$5,000,000	4,6,8,10
Signal Timing Improvements to SMART Corridors	Improve signal coordination along SMART Corridors	AZTech/MCDOT	Local Agencies	$500,000	4
Roadway Condition Reporting System	Add RCRS to new ITS cities w/o existing RCRS	AZTech/MCDOT	Local Agencies	$100,000	6,8,10,12,32
Traffic Management Center	Implement TMCs in new ITS cities	Local Agencies	Local Agencies	$1,000,000	4,17
Central Control Signal System	Install central control signal system into new ITS cities	Local Agencies	Local Agencies	$2,500,000	17
Railroad Crossing Deployment	Deployment of advanced railroad crossing devices if the pilot project proves effective	MAG/Local Agencies/ Railrds	MAG/Local Agencies/ Railrds	$2,000,000	21
ITS Pedestrian/Bicycle Projects	ITS pedestrian and bicycle projects	MAG/Local Agencies	Local Agencies	$500,000	15, 16, 52
SUBTOTAL				**$14,600,000**	
Transit Management System					
Bus Rapid Transit Priority	Increase signal prioritization project to accommodate new signals and buses	Valley Metro/Local Agencies	Valley Metro/Local Agencies	$1,000,000	13
Real Time Transit Arrival Time	Expand number of stops/routes that provide real time information on transit arrival at light rail and bus stops	Valley Metro/Local Agencies	Valley Metro/Local Agencies	$2,000,000	6,11,49
SUBTOTAL				**$3,000,000**	

TABLE 4 - MAG ITS STRATEGIC PLAN - RECOMMENDED PROJECTS
MID-TERM PROJECTS (2007-2011)

PROGRAM AREA/PROJECT	DESCRIPTION	IMPLEMENTING AGENCY	MANAGING AND OPERATING AGENCY	OPINION OF PROBABLE COST	ASSOCIATED USER NEEDS (ID NUMBER)
Incident/Emergency/Event Management Systems					
Regional Incident Management Plans Automation	Automate implementation of regional incident management plans on freeway and arterial streets	MAG	ADOT/Local Agencies	$2,000,000	1,2,5,10
Sky Harbor Parking Management System	Implement Parking Management System for the Sky Harbor Airport	Phoenix	Phoenix	$4,000,000	16
SUBTOTAL				**$6,000,000**	
Information Management					
Archived Data Server Expansion	Expand regional archived data server to allow increased data storage from additional sources	MCDOT	MCDOT	$300,000	24,52
SUBTOTAL				**$300,000**	
Commercial Vehicle Operations					
CANAMEX Corridor ITS Deployment	If study proves feasible, implement ITS technologies on designated CANAMEX Corridor	ADOT/MAG	ADOT	$1,000,000	18
				$1,000,000	
Planning and Outreach Support					
ITS Strategic Plan Update	Update ITS Strategic Plan	MAG	MAG	$350,000	10
ITS Training	Implement training program to enhance professional development	MAG	MAG	$250,000	15
ITS Outreach	Develop program to inform public of ITS technologies and how they can use information to improve travel	MAG/ITS Arizona	MAG/ITS Arizona	$250,000	15
ITS Project Evaluation	Approximately 5% of total budget for ITS projects to be used for evaluating projects (Evaluation budget to be spread out over 5 years)	MAG	MAG	$1,500,000	15
SUBTOTAL				**$2,350,000**	

TABLE 4 - MAG ITS STRATEGIC PLAN - RECOMMENDED PROJECTS
MID-TERM PROJECTS (2007-2011)

PROGRAM AREA/PROJECT	DESCRIPTION	IMPLEMENTING AGENCY	MANAGING AND OPERATING AGENCY	OPINION OF PROBABLE COST	ASSOCIATED USER NEEDS (ID NUMBER)
Telecommunications Infrastructure					
Chandler Police Department WAN Connection	Provide WAN connection from Chandler PD to Chandler TMC	Chandler	Chandler	$50,000	10
Gilbert Police Department WAN Connection	Provide WAN connection from Gilbert PD to Gilbert TMC	Gilbert	Gilbert	$50,000	10
Glendale Police Department WAN Connection	Provide WAN connection from Glendale PD to Glendale TMC	Glendale	Glendale	$50,000	10
Mesa Fire/Police WAN Connection	Provide WAN connection from Mesa Fire and PD to Mesa TMC	Mesa	Mesa	$80,000	10
Mesa Transit WAN Connection	Provide WAN connection from Mesa Transit to Mesa TMC	Mesa	Mesa	$50,000	10
Peoria Police Department WAN Connection	Provide WAN connection from Peoria PD to Peoria TMC	Peoria	Peoria	$30,000	10
Phoenix Police Department WAN Connection	Provide WAN connection for Phoenix PD	Phoenix	Phoenix	$50,000	10
Scottsdale Police Department/Transit WAN Connection	Provide WAN connection from Scottsdale PD and Transit to Scottsdale TMC	Scottsdale	Scottsdale	$50,000	10
Tempe Police Department/Transit	Provide WAN connection from Tempe PD and transit to Tempe TMC	Tempe	Tempe	$50,000	10
SUBTOTAL				**$460,000**	
TOTAL ITS IMPLEMENTATION PLAN				**$75,110,000**	
TOTAL FMS				**$44,650,000**	
TOTAL TRANSIT				**$3,000,000**	

TABLE 5 - MAG ITS STRATEGIC PLAN - RECOMMENDED PROJECTS
LONG-TERM PROJECTS (2012-2021)

PROGRAM AREA/PROJECT	DESCRIPTION	IMPLEMENTING AGENCY	MANAGING AND OPERATING AGENCY	OPINION OF PROBABLE COST	ASSOCIATED USER NEEDS (ID NUMBER)
Traveler Information Systems					
Regional ATIS	Implement regional advanced traveler information projects	MAG/Local Agencies	MAG/Local Agencies	$2,000,000	6
AZTech Work Stations	Add AZTech work stations to new ITS cities	AZTech/MCDOT	Local Agencies	$100,000	6,10,32
HAR Deployment	Deployment of HAR if the pilot project proves effective	ADOT/MCDOT	ADOT/MCDOT	$1,000,000	19
SUBTOTAL				**$3,100,000**	
Freeway Management System					
FMS Phase 13	Install FMS components on US60 (Power Rd to Idaho Rd)	ADOT	ADOT	$10,300,000	2,5,6,8,16
FMS Phase 14	Install FMS components on Loop 202S (Gilbert Rd to I-10)	ADOT	ADOT	$14,100,000	2,5,6,8,16
FMS Phase 15	Install FMS components on Loop 202N (SR 87 to Power Road)	ADOT	ADOT	$12,250,000	2,5,6,8,16
FMS Phase 16	Install FMS components on Loop 202 NE-SE (Power Rd to Gilbert Rd)	ADOT	ADOT	$31,900,000	2,5,6,8,16
ADOT TOC Upgrades	Upgrade ADOT TOC software and hardware	ADOT	ADOT	$1,000,000	6,8
SUBTOTAL				**$69,550,000**	
Arterial Management Systems					
SMART Corridor Upgrade	Upgrade components on existing SMART Corridors and add additional components as needed	AZTech/MCDOT	Local Agencies	$10,000,000	4,6,8,10
SMART Corridor Expansion/Addition	Expand existing corridors and add new corridors to provide additional coverage for high growth areas (Approximately 10 expanded or new routes)	AZTech/MCDOT	Local Agencies	$3,000,000	4,6,8,10
Signal Timing Improvements to SMART Corridors	Improve signal coordination along SMART Corridors	AZTech/MCDOT	Local Agencies	$500,000	4
Roadway Condition Reporting System	Add RCRS to new ITS cities w/o existing RCRS	AZTech/MCDOT	Local Agencies	$250,000	6,8,10,12,32
Traffic Management Center	Implement TMC in new ITS cities	Local Agencies	Local Agencies	$2,000,000	4,17
Centralized Signal System	Install central control signal system to new ITS cities	Local Agencies	Local Agencies	$2,000,000	17
Upgrade of Central Control Signal System	Upgrade of central control signal systems as needed	ADOT/Local Agencies	ADOT/Local Agencies	$10,000,000	17
ITS Pedestrian/Bicycle Projects	ITS pedestrian and bicycle projects	MAG/Local Agencies	Local Agencies	$1,000,000	15, 16, 52
SUBTOTAL				**$28,750,000**	
Transit Management System					
Real Time Transit Arrival Time	Expand number of stops/routes that provide real time information on transit arrival at light rail and bus stops	Valley Metro/Local Agencies	Valley Metro/Local Agencies	$2,000,000	6,11,49
Upgrade of Transit Systems	Scheduling/Payment Systems/AVL	Valley Metro/Local Agencies	Valley Metro/Local Agencies	$5,000,000	11,23,26,49
SUBTOTAL				**$7,000,000**	

TABLE 5 - MAG ITS STRATEGIC PLAN - RECOMMENDED PROJECTS
LONG-TERM PROJECTS (2012-2021)

PROGRAM AREA/PROJECT	DESCRIPTION	IMPLEMENTING AGENCY	MANAGING AND OPERATING AGENCY	OPINION OF PROBABLE COST	ASSOCIATED USER NEEDS (ID NUMBER)
Incident/Emergency/Event Management Systems					
Parking and Event Management System	Implement parking and event management systems at locations as needed	Local Agencies	Local Agencies	$10,000,000	16
SUBTOTAL				**$10,000,000**	
Information Management					
Archived Data Server Expansion	Expand regional archived data server to allow increased data storage from additional sources	MCDOT	MCDOT	$500,000	24,52
SUBTOTAL				**$500,000**	
Planning and Outreach Support					
ITS Strategic Plan Updates	Update ITS Strategic Plans	MAG	MAG	$500,000	10
ITS Training	Implement training program to enhance professional development	MAG	MAG	$250,000	15
ITS Outreach	Develop program to inform public of ITS technologies and how they can use information to improve travel	MAG/ITS Arizona	MAG/ITS Arizona	$250,000	15
ITS Project Evaluation	Approximately 5% of total budget for ITS projects to be used for evaluating projects (Evaluation budget to be spread out over 10 years)	MAG	MAG	$3,000,000	15
SUBTOTAL				**$4,000,000**	
Telecommunications Infrastructure					
Upgrade WAN Connections to Direct Fiber	Upgrade Agency WAN Connections to Direct Fiber	ADOT/AZTech/ Local Agencies	ADOT/AZTech/ Local Agencies	$4,000,000	10
SUBTOTAL				**$4,000,000**	
TOTAL ITS IMPLEMENTATION PLAN				**$126,900,000**	
TOTAL FMS				**$68,550,000**	
TOTAL TRANSIT				**$7,000,000**	

The cost for all projects are provided in current dollars. The total costs of the short-term, mid-term, and long-term recommended projects are as follows:

	Short-Term	Mid-Term	Long-Term
Total Implementation Plan:	**$123,232,500**	**$75,110,000**	**$126,900,000**
Total FMS:	**$61,580,000**	**$44,650,000**	**$68,550,000**
Total Transit:	**$35,000,000**	**$3,000,000**	**$7,000,000**

The cost of the projects recommended in the ITS Implementation Plan exceed the existing amount of funding provided by MAG for ITS deployment in the region; however, these projects are important to meet the regional needs of stakeholders in the MAG region. It is recommended that the MAG ITS Committee request additional funding from the MAG Regional Council to assist in implementing the projects in the ITS Implementation Plan.

The Telecommunications Program Area in **Tables 3** and **4** recommend projects based on the ITS Telecommunications Plan that was presented in Technical Memorandum No. 7 of the *MAG ITS Strategic Plan Update*. Technical Memorandum No. 7 should be referred to for more detailed descriptions of these projects.

It should be noted that several other significant efforts are underway in the MAG region to address ITS needs. ADOT is currently involved in the Commercial Vehicle Information Systems and Networks (CVISIN) program to integrate ITS projects into the commercial vehicle operations (CVO) processes. As part of that project, an ITS/CVO Business Plan was produced that identified several statewide ITS/CVO projects. While these projects will be implemented on a statewide basis, they could provide significant benefits for motor carriers operating in the MAG region.

There is also an effort underway by Valley Metro to develop and implement a Vehicle Management System. This would include several ITS projects that would integrate ITS technologies into Valley transportation agencies. Currently, Valley Metro has issued two Requests for Proposals for the Vehicle Management System, including a project to implement a Fixed Route Scheduling System and a project to implement a Trip Planning System.

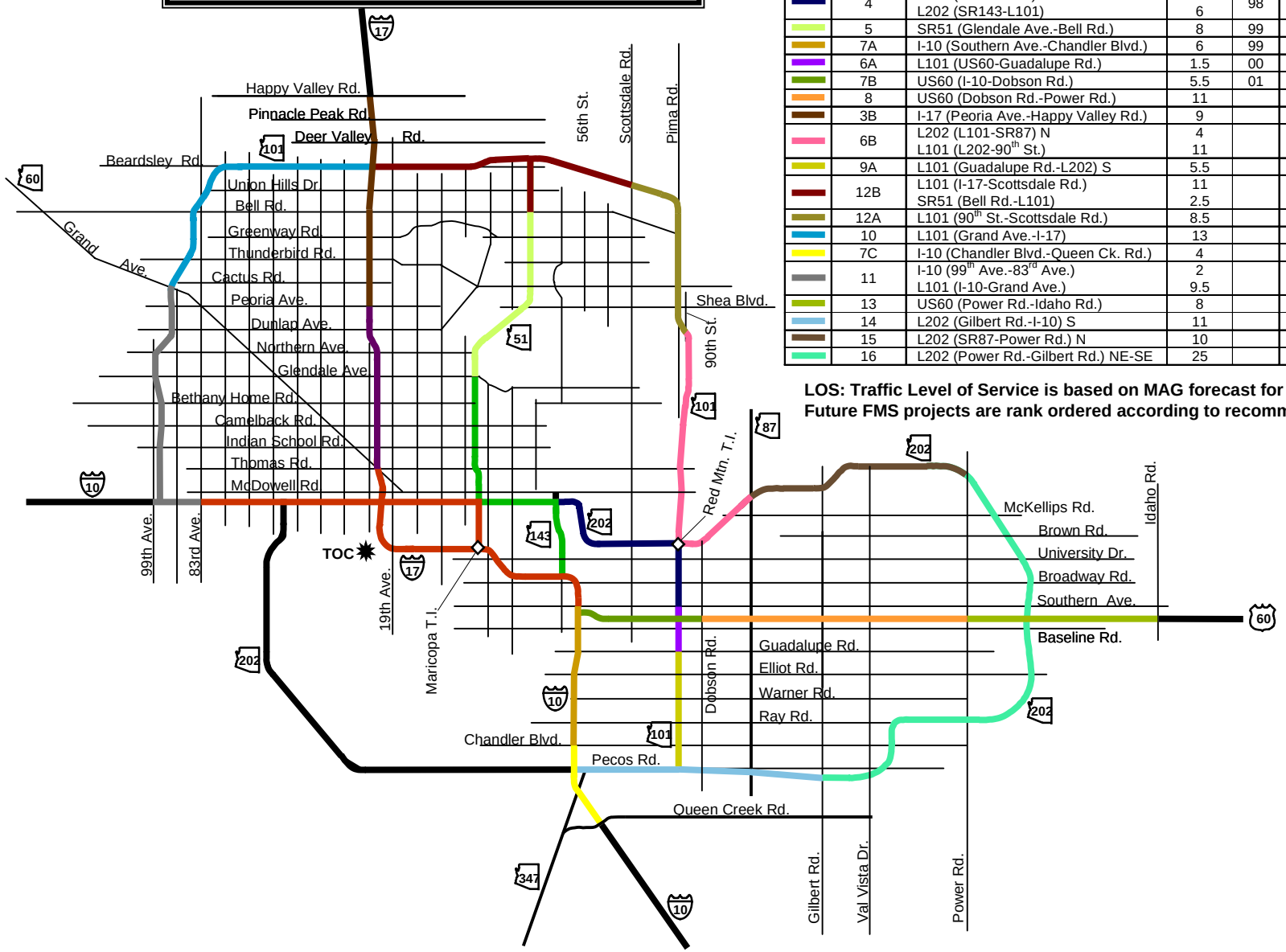
3.2.1 Freeway Management System Prioritization

Segments of the Freeway Management System that have been prioritized by MAG, in consultation with ADOT, have been included in the Implementation Plan. **Tables 3, 4, and 5** identify which segments should be included for short-term, mid-term, and long-term implementation.

Segments which are currently operating at a level of service (LOS) D or less have been included for implementation in the short-term. Those segments currently operating at a LOS C are recommended in the mid-term, and those segments with a LOS B or greater are recommended in the long-term.

A color-coded map is included in **Figure 1** which displays the segments of the Freeway Management System, the status of implementation, and the current level of service for which the segment is operating. In **Figure 2**, the level of planned implementation of FMS on the freeway system is displayed. **Figures 1 and 2** were developed by ADOT and represent the latest information available as of March 2000.

FREEWAY MANAGEMENT SYSTEM
PHOENIX METROPOLITAN AREA
FIELD IMPLEMENTATION
EXISTING AND RECOMMENDED PROJECTS



	PHASE	DESCRIPTION	MILE	FY	STATUS	LOS
	1	I-10 (83rd Ave.-Southern Ave.) I-17 (Thomas Rd.-Maricopa T.I.)	21 8	94	Completed	
	2	SR51 (I-10-Glendale Ave.) SR143 (I-10-L202) L202 (I-10-SR143)	5.5 4 3	96	Completed	
	3A	I-17 (Thomas Rd.-Peoria Ave.)	7	99	Under Constr.	
	4	L101 (US60-L202) L202 (SR143-L101)	3 6	98	Under Constr.	
	5	SR51 (Glendale Ave.-Bell Rd.)	8	99	Under Constr.	
	7A	I-10 (Southern Ave.-Chandler Blvd.)	6	99	Under Design	
	6A	L101 (US60-Guadalupe Rd.)	1.5	00	Under Design	
	7B	US60 (I-10-Dobson Rd.)	5.5	01	Programmed	
	8	US60 (Dobson Rd.-Power Rd.)	11		Not Programmed	D-F
	3B	I-17 (Peoria Ave.-Happy Valley Rd.)	9		Not Programmed	D-F
	6B	L202 (L101-SR87) N L101 (L202-90th St.)	4 11		Not Programmed	D-F
	9A	L101 (Guadalupe Rd.-L202) S	5.5		Not Programmed	B-D
	12B	L101 (I-17-Scottsdale Rd.) SR51 (Bell Rd.-L101)	11 2.5		Not Programmed	B-D
	12A	L101 (90th St.-Scottsdale Rd.)	8.5		Not Programmed	A-C
	10	L101 (Grand Ave.-I-17)	13		Not Programmed	A-C
	7C	I-10 (Chandler Blvd.-Queen Ck. Rd.)	4		Not Programmed	A-C
	11	I-10 (99th Ave.-83rd Ave.) L101 (I-10-Grand Ave.)	2 9.5		Not Programmed	A-C
	13	US60 (Power Rd.-Idaho Rd.)	8		Not Programmed	A-B
	14	L202 (Gilbert Rd.-I-10) S	11		Not Programmed	A-B
	15	L202 (SR87-Power Rd.) N	10		Not Programmed	A-B
	16	L202 (Power Rd.-Gilbert Rd.) NE-SE	25		Not Programmed	A-B

LOS: Traffic Level of Service is based on MAG forecast for 2005.
Future FMS projects are rank ordered according to recommended implementation priority.

Figure 1 – FMS Existing and Recommended Projects
March 2000

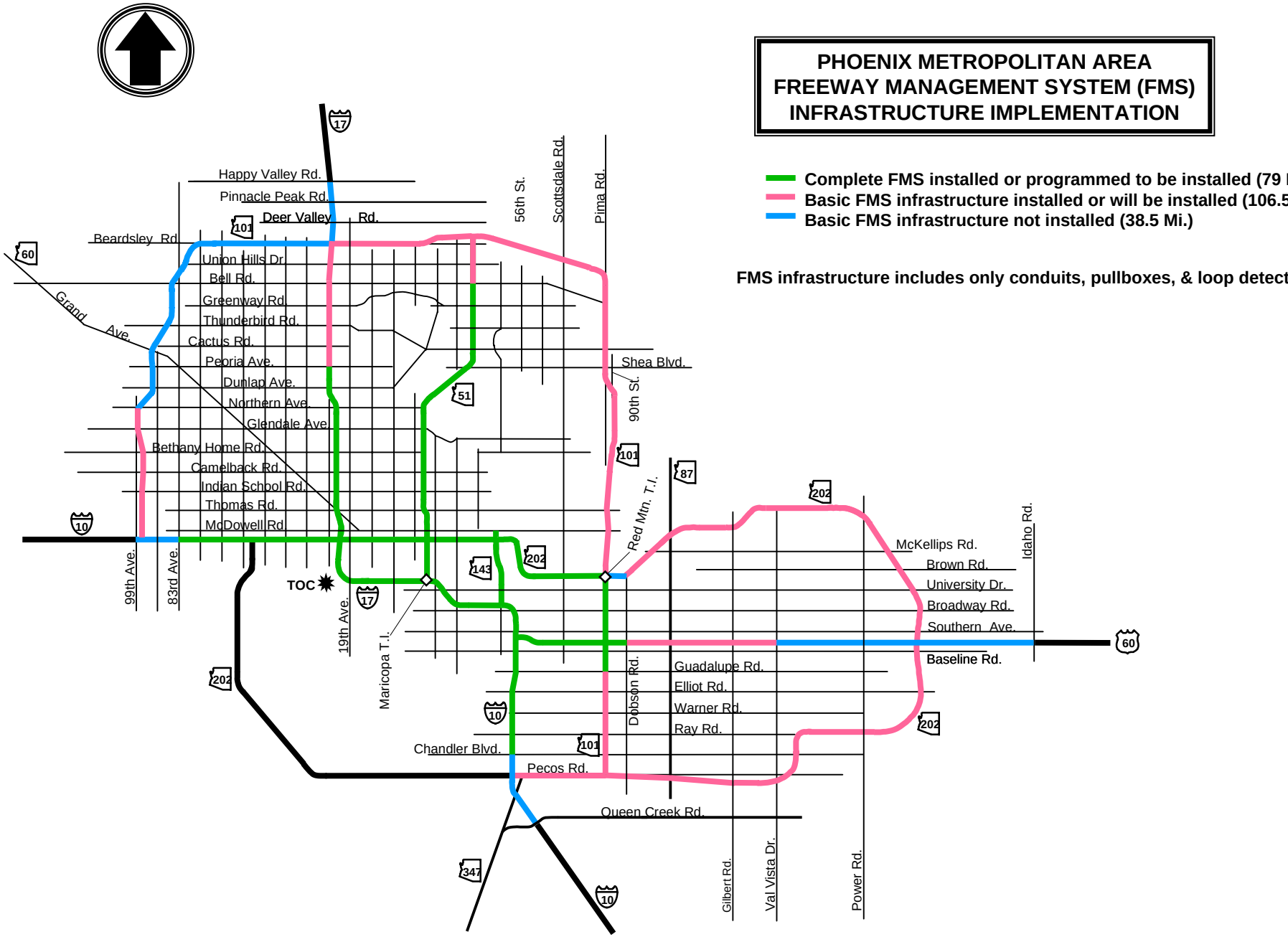


Figure 2 – FMS Infrastructure Implementation
March 2000

3.2.2 SMART Corridors

The ITS Implementation Plan includes projects to complete the SMART Corridor implementation as well as improve interjurisdictional signal coordination along the corridors.

A total of 24 SMART Corridors were identified in the AZTech™ MMDI project. These corridors are key arterial links that span the urban area and pass through multiple jurisdictions. SMART Corridors are implemented with detection, CCTV cameras and variable message signs. Traffic signals are coordinated across multiple jurisdictional boundaries and freeway interchanges signals are coordinated with arterial street signal systems. Implementation of SMART Corridors will improve safety standards and facilitate regional mobility.

Figure 3, provided by MCDOT, displays the three phases of the SMART Corridors that are currently planned for implementation. Phase 1 of the SMART Corridors has been implemented, and Phase 2 is currently in the design phase. Phase 3 is expected to begin design in the year 2001.

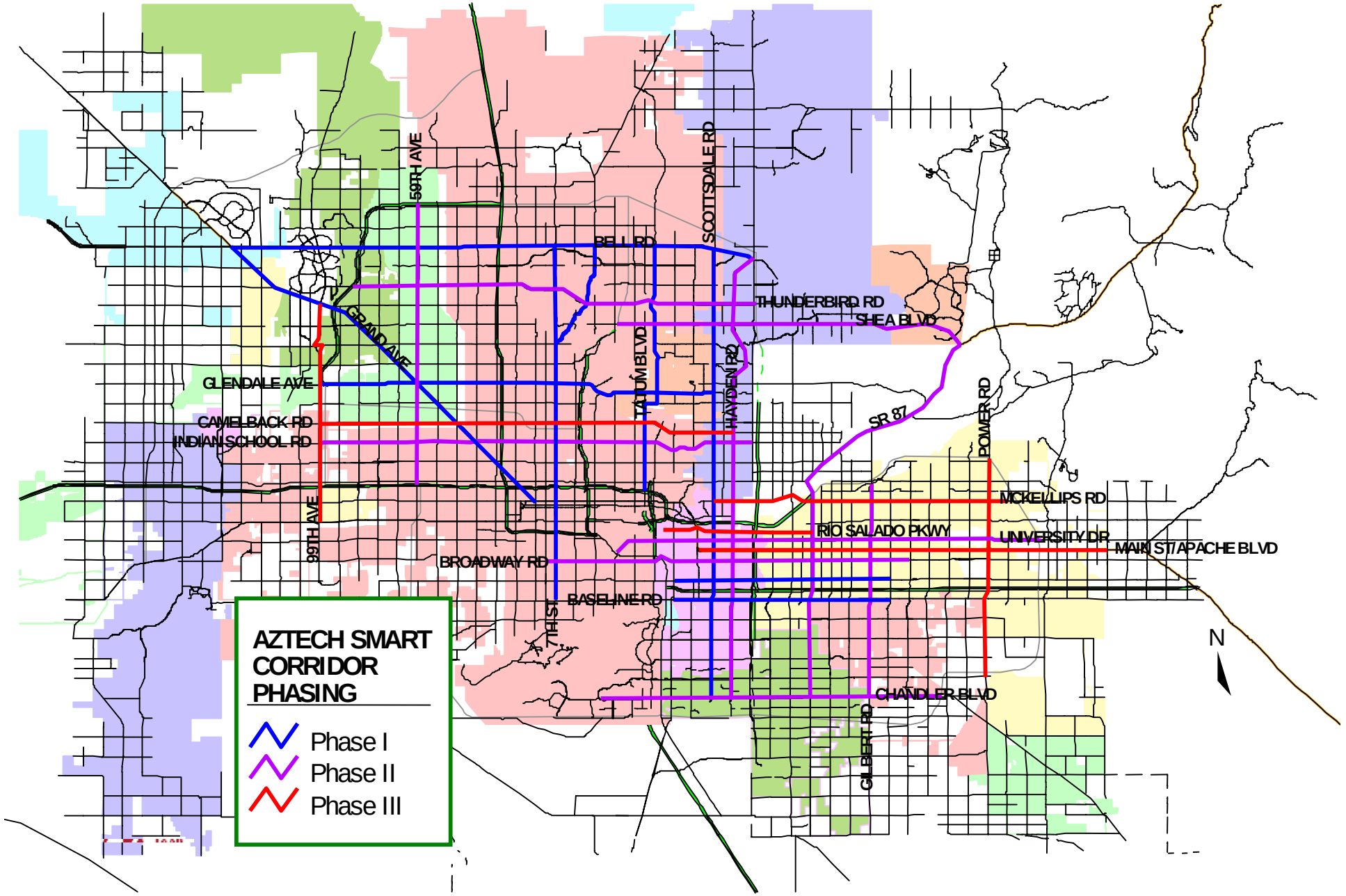


Figure 3 – AZTech™ SMART Corridors

4. MANAGEMENT AND OPERATIONS RESOURCES

Tables 6 and 7 provide a recommendation for the full-time employees (FTE) needed to manage and operate the recommended projects in the MAG Draft TIP and the Short-term ITS Implementation Plan. Mid-term and long-term projects are not addressed in this section; these assumptions regarding the maintenance and operational requirements of ITS technologies in the mid-term and long-term would be questionable.

Management and operations of ITS projects are critical, and it is important for agencies to determine the required staff needed when considering implementing an ITS project. Without the proper staffing, an ITS project might not deliver its intended services and the expected benefits of the projects might not be realized.

FTEs include all personnel needed to staff, operate, manage, and maintain the infrastructure and facilities associated with the project. The required number of FTEs depends on both the level of implementation of the project (i.e., the number of field components, level of maintenance required, etc.) and the level of operation of the project. For example, a traffic management center may be staffed 24 hours per day, only during business hours, or only during incidents or special events.

The Institute of Transportation Engineers has recommended that for maintenance, an average of one FTE is required for 37 traffic signals. This number provides a basis for establishing the maintenance requirements for ITS equipment. Variable message signs typically require more maintenance than other types of ITS field devices, and may be considered equivalent to the maintenance of a traffic signal. Other field devices, such as CCTV cameras and detectors will require considerably less maintenance. Operations of the ITS systems is harder to quantify, as several variables will factor into the operations. Depending on the level that an agency desires to operate its system and the number of functions its staff can perform, the FTEs for operating a system can vary from agency to agency.

In **Tables 6 and 7**, FTEs are estimated for all aspects of operating and managing the ITS system. The numbers are conservative, and should be used as a starting point to determine the need for additional staff when implementing ITS projects. The agency responsible for operations and maintenance of the project being implemented must consider existing staff and the level of service that they wish to operate their ITS system, and use these considerations to determine the appropriate number of FTEs.

Perhaps the most important function of **Tables 6 and 7** are that they clearly show that additional staff is needed to manage and operate new ITS projects in the MAG region. While the exact number of FTEs may be debated, what is most important is that agencies realize that the new ITS systems implemented in the MAG region will require additional staff to be effective and to realize the benefits that can be achieved.

TABLE 6 - RECOMMENDED NEW FULL TIME EMPLOYEES (FTE) NEEDED FOR MANAGEMENT AND OPERATIONS

2001-2005 DRAFT TIP PROJECTS

PROGRAM AREA/PROJECT	IMPLEMENTING AGENCY	MANAGING AND OPERATING AGENCY	FTEs (MANAGEMENT AND OPERATIONS)
Freeway Management System			
Freeway Service Patrol (FY 2001)	DPS/MAG	DPS	6
Freeway Service Patrol (FY 2002)	DPS/MAG	DPS	1
Freeway Service Patrol (FY 2003)	DPS/ADOT	DPS	1
Freeway Service Patrol (FY 2004)	DPS/ADOT	DPS	1
Freeway Service Patrol (FY 2005)	DPS/ADOT	DPS	1
Arterial Management Systems			
Chandler Traffic Operations Center Upgrade	Chandler	Chandler	0.1
Chandler Citywide Traffic Control Upgrades	Chandler	Chandler	0.1
Chandler Signal Intertie	Chandler	Chandler	0.1
Chandler CCTV	Chandler	Chandler	0.1
Gilbert ATMS	Gilbert	Gilbert	0.25
Glendale Computerized Signal System (Phase I, II, and III)	Glendale	Glendale	1
Glendale Traffic Management Center	Glendale	Glendale	1.5
MCDOT Traffic/Air Quality Monitoring	MCDOT	MCDOT	0.05
MCDOT Regional Traveler Information System	MCDOT	MCDOT	0.5
MCDOT Regionwide Traffic Signal Equipment Upgrades	MCDOT	MCDOT	0.25
AZTech CCTV Program (Phase II)	MCDOT	Local Cities	0.1
AZTech SMART Corridor Program (Phase II)	MCDOT	Local Cities	1
AZTech VMS	MCDOT	Local Cities	0.25
MCDOT Bell Road	MCDOT	MCDOT	0.5
Mesa Traffic Operations Center Projects (2001)	Mesa	Mesa	0.25
Mesa Traffic Control Signal System	Mesa	Mesa	0.1
Mesa Communications/ITS Infrastructure	Mesa	Mesa	0.25
Mesa SMART Corridor	MCDOT/Mesa	Mesa	0.25
Mesa Traffic Control System (2003)	Mesa	Mesa	0.25
Mesa Real-Time Adaptive Signal System	Mesa	Mesa	0.1
Peoria Citywide Traffic Signal Interconnect System	Peoria	Peoria	1
Scottsdale Fiber Optic and CCTV	Scottsdale	Scottsdale	0.25
Scottsdale SMART Corridor Traffic Control System	Scottsdale	Scottsdale	0.25
Tempe Traffic Signal Controller Cabinet Upgrade (2002-03)	Tempe	Tempe	0.1
Tempe Traffic Signals	Tempe	Tempe	0.25
Incident/Emergency/Event Management Systems			
MCDOT Parking and Traffic Management System	MCDOT	MCDOT	0.5
Phoenix Downtown Traffic Management System (Phase I and II)	Phoenix	Phoenix	6
Planning and Outreach Support			
Chandler ITS Planning Study	Chandler	Chandler	0.1
Telecommunications Infrastructure			
Chandler Fiber Optic Line	Chandler	Chandler	0.25
TOTAL FTEs			**25.7**

TABLE 7 - RECOMMENDED NEW FULL TIME EMPLOYEES (FTE) NEEDED FOR MANAGEMENT AND OPERATIONS

SHORT-TERM IMPLEMENTATION PROJECTS

PROGRAM AREA/PROJECT	IMPLEMENTING AGENCY	MANAGING AND OPERATING AGENCY	FTEs (MANAGEMENT AND OPERATIONS)
Traveler Information Systems			
Integration of a Regional ATIS/ATMS System	ADOT/MCDOT	ADOT/MCDOT	0.5
AZTech Work Stations	AZTech/MCDOT	Local Agencies	1
Traveler Information Systems Upgrade	ADOT/Local Agencies/Private Sector	ADOT/Local Agencies/Private Sector	0.25
Arterial Speed Maps	MAG/Local Agencies	Local Agencies	0.5
Freeway Management System			
FMS Phase 8 (11miles)	ADOT	ADOT	1.5
FMS Phase 3B (9 miles)	ADOT	ADOT	1.25
FMS Phase 6B (15 miles)	ADOT	ADOT	2.25
FMS Phase 9A (5.5 miles)	ADOT	ADOT	1
FMS Phase 12B (13.5 miles)	ADOT	ADOT	2
Freeway Service Patrol/ATMS Link	ADOT/DPS	ADOT/DPS	0.25
ADOT TOC Upgrades	ADOT	ADOT	0.1
Arterial Management Systems			
SMART Corridor Freeway Alternate Routes Expansion/Addition	AZTech/MCDOT	Local Agencies	1.5
Roadway Condition Reporting System	AZTech/MCDOT	Local Agencies	0.5
Traffic Management Center	Gilbert	Gilbert	1
Signal Timing Improvements to Interjurisdictional Signals and SMART Corridors	MAG/Local Agencies	Local Agencies	0.1
Railroad Crossing Pilot Program	Local Agencies	Local Agencies	0.25
Transit Management System			
Scheduling System	Valley Metro/Local Agencies	Valley Metro/Local Agencies	1
Trip Planning System	Valley Metro/Local Agencies	Valley Metro/Local Agencies	1
Regional Validating Farebox	Valley Metro/Local Agencies	Valley Metro/Local Agencies	1
Vehicle Management System	Valley Metro/Local Agencies	Valley Metro/Local Agencies	2
Bus Rapid Transit and Light Rail Signal Priority	Valley Metro/Local Agencies	Valley Metro/Local Agencies	1
Audio/Visual Announcements	Valley Metro/Local Agencies	Valley Metro/Local Agencies	0.5
Passenger Counting	Valley Metro/Local Agencies	Valley Metro/Local Agencies	0.5
Real Time Transit Arrival Time	Valley Metro/Local Agencies	Valley Metro/Local Agencies	1
Transit Routing Based on Incident Information	Valley Metro/Local Agencies	Valley Metro/Local Agencies	0.25
Incident/Emergency/Event Management Systems			
Regional Incident Management Plans	MAG	ADOT/Local Agencies	0.5
Regional Incident Management Coalition	MAG	MAG	0.1
Integrate Traffic/Dispatch System	ADOT/Phoenix Fire	ADOT/Phoenix Fire	1
Phoenix International Raceway Special Event Traffic Management System	MCDOT	MCDOT	0.25
Commercial Vehicle Operations			
CANAMEX Corridor Study	ADOT/MAG	ADOT	0.1
Planning and Outreach Support			
Local ITS Deployment Plans	Local Agencies	Local Agencies	0.25
Regional Concept of Operations	MAG	ADOT/Local Agencies	0.25
ITS Training	MAG	MAG	1
ITS Outreach	MAG/ITS Arizona	MAG/ITS Arizona	0.1
ITS Project Evaluation	MAG	MAG	0.5
ITS Pedestrian/Bicycle Projects	MAG/Local Agencies	Local Agencies	0.1
Telecommunications Infrastructure			
Combined Communication System Projects	Various Agencies	Various Agencies	2
TOTAL FTEs			**28.35**

5. PROJECT PRIORITIZATION

The MAG ITS Committee has developed an ITS Project Rating System designed to help the Committee prioritize ITS projects submitted by member agencies for inclusion in the annual update of the TIP. The system provides a systematic and objective comparison of projects, taking into account key factors considered important by the Committee. The ITS Project Rating System has been revised several times since it was first launched in 1998, and the description below represents the version of the system that was adopted by the MAG ITS Committee on June 21, 2000.

The rating system has been developed for both transit and non-transit ITS projects. A number of factors are considered in the rating system to ensure that projects that foster regional integration, consistency with the architecture, and yield a high cost-benefit ratio are considered in the project prioritization process. Projects are scored on the following factors:

Deployment Priority – Non-transit projects receive points for location of the project within a priority area as defined by the city or town and location of the project on an ITS priority corridor. Non-transit projects may be penalized if the project is an upgrade or improvement to a system launched with federal funds, and bonus points may be awarded for systems that address special events. For transit projects, points are awarded if the project is recommended in RPTA's Vehicle Management System Master Plan.

Congestion/Utilization – Non-transit projects receive points for high levels of congestion based on vehicle miles traveled per lane mile. Transit projects receive points based on prevailing load capacity.

Cost Benefit – Non-transit projects receive points based on the vehicle miles traveled served by the project per dollar of project cost. Transit projects receive points based on the amount of total passenger miles traveled served per dollar of project cost.

Jurisdiction Match – Both non-transit and transit projects receive points based on the amount of cost sharing proposed by local jurisdictions.

The rating system will continually evolve as the MAG ITS Committee seeks to develop a system that will evaluate projects and allocate MAG funding in an equitable fashion that benefits both the region and local areas. Regardless of the methodology used to rate projects, the ITS Project Rating System purpose will continue to be to accomplish the following objectives:

- Provides the ability to rate projects submitted by all member agencies on an objective basis;
- Encourages integrated rather than fragmented systems;
- Encourages regional cooperation;
- Encourages projects that extend seamlessly across boundaries;
- Encourages projects that are likely to yield higher cost-benefits ratio; and
- Encourages higher matching funds by cities and stretches the federal funds for more projects.

In order to encourage the implementation of the regionally significant projects recommended in the ITS Implementation Plan, it is recommended that the MAG ITS Committee adjust the ITS Project Rating System so that projects included in the ITS Implementation Plan may receive additional points.

6. RECOMMENDATIONS

There are several recommendations that are critical for a successful implementation of the ITS projects identified in this Technical Memorandum. These recommendations are described below:

- Regionally significant ITS projects implemented in the MAG region should address the stakeholder needs of the region;
- Locally significant ITS projects should address local needs and support regional objectives;
- All ITS projects implemented in the MAG region should be consistent with the regional architecture that has been adopted by the MAG ITS Committee;
- The MAG ITS Committee should continue to prioritize ITS projects for both regional and local needs;
- Funding for the management and operations of ITS projects should be included as part of the TIP;
- The MAG ITS Committee should consider management and operations of an ITS project before including the project in the TIP;
- An agency submitting an ITS project for inclusion in the TIP should address the staffing requirements and the management and operations required for the project;
- The MAG ITS Committee should adjust the ITS Project Rating System so that projects included in the ITS Implementation Plan may receive additional points to encourage their implementation; and
- The MAG ITS Committee should request additional funding from the MAG Regional Council to assist in implementing the projects in the ITS Implementation Plan.